

Evaluating the effect of financial, economic, political, international risks on Tehran Stock Exchange Index Using Markov Switching Approach (MS-VAR)

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Abstract:

Risk in itself can upset equations and upset equilibria. Financial, economic, political and international risks are among the risks in the business environment. In this study, an attempt has been made to measure the impact of risks on the return index of the Tehran Stock Exchange and for this purpose, the Markov switching model has been used to observe the impact of these risks in different regimes. For this purpose, seasonal data from 1388 to 1398 have been used. The results indicate that by equipping the LR test, nonlinear models are better than linear models. Also, according to the results of shock-positive reactions, the positive doubt on the economic risk in both regimes for a period is initially It has a lot of negative effect on the stock index and then the effect of doubt disappears and the positive doubt on the financial risk variable, if we are in the first regime, this effect will be positive on the index in a future period and negative if it is in the second regime in a later period And in the variables of political and international risk in the first and second regimes with a positive doubt, the effect of both on the stock market index is similar, so that in the first regime is negative and in the second regime this effect is positive.

Keyword: Financial risk, Economic risk, Political Risk, Markov switching

Introduction

Economic development in any country requires long-term economic growth in such a way that positive and even slow growth can lead to economic development, and strong fluctuations in the way to this development. Financial development is one of the factors that play a major role in achieving economic growth in any country. Therefore, the more developed stock market countries have the ability and experience of higher economic growth and are on a faster path to economic growth. The growth of attention to capital markets around the world over the past two decades and their increasing integration have made it necessary for governments to make the development of local stock markets a priority.

The relationship between the financial and production systems of each country is one of the most important factors in economic growth and development. Countries that have an effective model in capital allocation to various economic sectors often have higher economic development and social welfare. The provision and allocation of investment resources to economic activity is carried out through financial markets. That the stock exchange is the main part of the market.

Therefore, because of the importance of the markets in the process of creating wealth and ultimately welfare for a community, paying attention to the factors that are effective in these markets and providing the participation of members of a community in it, it may be crucial to the Stock Exchange, the capital market, which has an effective role in mobilising financial and capital in order to finance long-term investment projects. The level of development of financial markets, especially the stock market, and its impact on financing companies, has greatly affected economic growth. The main determinants of financial development include corporate, legal, institutions, economic policies and political factors. Therefore, considering the importance of financial markets to identify the factors affecting the development of

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financial – market from different – angle, and especially attention to financial markets, both from the view of corporate domestic factors and macroeconomic factors, it is important.

In 1989, Hamilton used the Markov Switching model in the literature of time series economist. The Hamilton's research specifically was suggested that not only is the nonlinear behavior observed in the economic time series but also this nonlinear behavior specifically can be considered in the asymmetry of the economic cycles. Hamilton provides a model that can see different effects of this change in economic behavior by understanding the transition from a positive growth rate to a negative growth rate caused by the US business cycles. After Hamilton's study, Markov Switching models are widely used in analyzing various economic phenomena. Therefore, this study aims to investigate the factors affecting the growth of the stock index from 2009 to 2019 in view of the financial, economic, political and international risks by the Markov Switching Method. In the second part, the research background and the assessment of the model and conclusion are discussed.

2. Theoretical foundations

Kindlerberg and Robert Iber in their well-known research called insanity, fear and fall: A history of financial crises, which dates back to the seventeenth century, shows that over the past 30 years, more national banking systems have fallen compared to other similar time periods, and the scope of change in currency prices has been much higher than the previous period. In addition, they argue that these crises are all linked together by liberating international financial currents and involving an increased amount of money in the world that sought for higher return: - The 1980s new market debt crisis was created by international commercial banks using the recovery of OPEC dollar in the 1970s. Non-payment of debt in Latin America, Africa, East Europe and Asia came into being after the United States raised interest rates in 1979, also led to a savings crisis and a U.S. loan). The flow of capital then moved to Japan, which in the second half of the 1980s caused a bubble in the value of Japanese stock and properties. - The Japanese bubble explosion in the early 1990s led to the withdrawal of money from Japan and elsewhere in Asia, creating a credit bubble that had been exacerbated by the U.S.'s monetary policy since 1994 and the debt crisis from Mexico to Asia. - With the collapse of the Asian market in 1997, money was directed toward the United States (supporting the American bubble.com), East Europe and Russia (tacz, 2019).

Still in the middle of its economic transition, Russia was not prepared to attract investment flow, and in 1998 Argentina went into bankruptcy after that in 2001. At the end of the investment wave, Turkey and Brazil went through the exchange and banking crisis and needed the IMF support to overcome these investment currents. Since 2003, emerging markets have had periods of no financial crisis. Meanwhile, the largest credit bubble in the U.S. and the Euro region was creating. The bubble ended in 2008 with a crisis of historic proportions, when problems in the U.S. finance market led to the collapse of several major financial institutions in the United States and Britain. - After the 2008 crisis in the developed world, capital flow was transferred to emerging goods and markets. Now we see the start of a change in this process (tacz, 2019).

In short, in the second era of globalization, significant financial advances have a role in the nature and form of financial crises, including global financial assets growth compared to GDP, increased global correlation of financial markets, the change of role of central banks and the increasing number of independent countries affected by floating currencies; customer investment; And the quick creation of new and often obscure financial tools. Also, the growth of accounting on the balance sheet and the high reliance coefficient of financial institutions was related to the 2008 global financial crisis

According to research literature, one of the most important causes of the lack of growth and efficiency of the markets is the high risk of production and exchange and therefore the high cost of exchange. The risks

of social and the different social will eventually spread to the markets, which will increase the cost of decisions, reduce the motivation for participation in the market, production and exchange. In this case, it will grow from the heart of the markets instead of efficiency, wealth, inefficiency and injustice (North, 2005). One of these markets, which is heavily affected by these risks and the increase in the cost of exchange, is the stock market.

Fluctuations in exchange rate, property deprivation and lack of contracts are among the factors that impose severe risks on investors and companies, thus reducing their incentive to invest. Political, economic stability and the absence of conflicts and tensions are important factors in attracting investment and making the stock market more efficient. In general, investors do not invest in unstable political countries, which is likely to be toppled or are suffering from a high degree of political and moral tension. A stable political environment reduces the risk of sudden changes in laws and termination of contracts. In a volatile country, people are concerned about their capital. (Faaljoo and Sadeghpour, 2016).

Earlier, believed that the return is only a function of systematic risk, and the investor would receive the higher efficiency before the systematic risk, and the non-systematic risk of an added risk that would not be tolerated by any morphology for capital. But in the new investment theory (Arbitarge Ras (1976), Chen et al. (1986), the claim proved that non-systematic risks have a significant impact on the investor's efficiency and the stock exchange, challenging the pricing model of CAPM and Sharpe's capital (Shah Abadi et al., 2013).

The claim that economic variables, such as inflation, criticism, exchange rate and etc. The channel is effective on stock prices, which is accepted as a theory. In past years, studies such as Kwon and Shin (1999), Christiansen et al (2012), Engleand Sohn (2013) and Bekiroset (2017) have shown the impact of economic forces on the stock exchange. The basis of these experimental studies is the theory that stock prices reflect the current value of future cash flows. For this reason, both future cash flows and the expected yield rate are required. Thus, the economic variables are effective on both future cash flows and on expected return rates. Therefore, they can affect stock prices (Chadouri, 2006).

Inflation is one of the macroeconomic variables that may affect insystematic risk. Inflation has direct effects on the optimization strategy of businesses. Inflation is considered when it comes from the company's financial balance revenue. This variable is not only an undesirable element, it can be desirable for company production. But when it looks at the cost, this variable can adversely affect the company's spending structure and put businesses exposed to contracts for raw materials and new wages every day, which will reduce the company's profitability and thus reduce the value of the shares. It also makes high inflation rates ineffective by creating uncertainty and friction of financial markets in allocating the financial system's resources. Therefore, as inflation increases, production increases, and businesses show a less willing to take risks. (Raie Saeidi, 2008). Therefore, inflation is dependent on the result of these two forces, and the result is based on the structure of costs and production of the company, the industrial structure where they compete, and high-level laws on price changes.

The exchange rate risk is another variable that affects stock return. Changes in this variable also affect the value of national currency and deplete the value of national currency. In confronting this risk, investors need to make up for their expenses and revenues in order to seem logical to take risks. Change in the exchange rate could have two different effects on stock prices. On the one hand, an increase in the exchange rate (after demand) leads to an increase in the income of COMMODITY companies, as a result of the price of their shares, and on the other hand, (after the supply) results in a decrease in the profits of the import companies of brokerage firms and a drop in their stock prices.

In addition to dividing the stock market, stock buyers also pay attention to the company's intrinsic value changes. Industries that require the production and operation of machinery from abroad are affected by the change in exchange rate. If a company imported machinery at low exchange rates, the intrinsic value of the company will also increase as the exchange rate increases. In addition, if the exchange rate is reduced over time, the company will have a reverse result for these companies (Faaljo and Sadeghpoor, 2016).

Another variable that can affect stock return. Liquidity is. Different schools have different views on how to affect the volume of change on real economic variables, as well as the prices of goods and. But everyone agrees that a change in the currency volume in the long run will lead to a change in the prices of goods and, including the price of stocks. In general, the effective mechanism is that any increase in the supply of money by reducing interest rates increases the demand for financial, including shares, and as a result, the price increases are (ShahAbadi et al., 2013). The more important point to be mentioned in this regard is the relationship between liquidity and inflation, in other words by converting liquidity to inflation in practice between these two variables, which is the relationship between inflation and stock return.

Therefore, in addition to increasing growth rate, the policy can lead to business deficit and small budget budgets, inflation and low interest rates and reduce the cost of transactions and risks of investment opportunities and improve business and production.

Another one that can be referred to and its effect on the market can influence the return of stock and consequently change of indicators, and increase the uncertainty and risk of the market. The present paradigm in the financial sector is behavioral.

Therefore, the economic climate is surrounded by a variety of economic, financial, political and international risks, which may reduce the investor's impetus for participation in financial markets due to the nature of investment risk. Also, instability of economic, political or financial components leads to the stock market bubble and the collapse of the stock market. Therefore, understanding how to influence the economic, political and financial climate on investment risk in the securities market is necessary. While the importance of economic factors on stock market return or stock market fluctuations is important. But more \neg , not the impact of risk on the stock market, but also determining which kind of \neg risk has the most impact on the stock market, and this may be very much considered for policy makers and investors.

2.1. Research Literature

Das et al. (2019) are responding in a study titled "Are the emerging stock markets responding to international economic policies, geopolitical risk and financial stress? "Examining the effects of international economic policies (US), geopolitical danger and financial pressure are taking an equal turn on the emerging stock market," he said. The 24 emerging markets are considered to measure the acceptance of these markets to the shocks of the U.S. macroeconomics. The monthly data used from January 1997 to May 2018 and unusual testing - in Kinles, was used as a methodological approach. The results of this study show that 1- the influence of such shocks on the market is not heterogeneous in terms of causality and severity. 2- The effect of EPU compared to two other shock indices, such as GPR and FS, is so deep and notable:- The causality ratio is greater and not stronger than the causality. Finally, (D) EPU, GPR and FS forecasts are limited to the upper tail. Authors believe the findings are inherent in the context of investors in EMs to diversify international investment and develop investment strategies in economic conditions.

Dreyce (2018) studied the impact of domestic factors - economic, financial and political risks - and external factors - on the stock market index in Taiwan in a study titled "Insur Internal Risk and External Risks on emerging stock markets." To achieve the purpose of this study, ARDL, DOLS and Markov Switching Tests have been used. The data for the three months of 2015-1997 is used, and the findings show that combining

internal and external risk factors has a long-term effect on the stock market index. Moreover, the decline in economic, political and financial risks is accompanied by an increase in the stock market index in Taiwan.

Jang et al. (2015) have studied the relationship between political uncertainty and stock prices in seven OECD countries using the Booster Causality Test (BCC) using the monthly data during the 2001-2013 period. Experimental results indicate that there is a bilateral relationship between political uncertainty and stock prices in Italy and Spain; In the UK and USA, however, only one side of uncertainty is the price of shares. There is no causality in Canada, France and Germany.

Pradhan et al. (2014) in their study investigated the dynamic relationship between economic growth, oil prices, the depth of the financial market and other macroeconomic variables in the member states of 20-G during the 1961-2012 period were investigated by Granger causation of self-regression. The results show that there is a strong long-term relationship between economic growth, oil price, stock market depth, real exchange rate, inflation rate and real interest rate and there is a very complex network among variables in the short term.

Franky et al. (2014) in a study titled "Political Risk and Destabilisation of the Stock Exchange in Middle East and North Africa (MENA)", examined the impact of political risk (caused by civil uprisings in the Arab World) on the instability of the major markets in the MENA region. First, with the distinction between the stock exchange and Islamic indexes, we see that these two investment groups are inhomogeneous to the recent political turmoil. In particular, we directly mention the rise of fluctuations in Islamic indices during the period of political unrest, while the uprisings have had little or no impact on the fluctuations of conventional markets. Such differences were confirmed by further analysis in a multi-variable Garch model. Second, regardless of its impact on fluctuations, there is little evidence that MENA markets have turned into international markets after the political revolution. Third, similar results for criteria have not been determined, which show that changes are caused by political tensions. In general, these results are solid to model specifications and according to the concept of political uncertainty resulting from financial fluctuations. In general, the findings are important in understanding the role of political uncertainty in the stability of the stock exchange, and are of great importance to investors and market regulators.

Solman (2013) developed by using monthly data on 74 stock markets and developing for the 1984-2012 period, in a study titled "Political risk Rate Dynamics on the Stock Exchange" to examine the stock exchange's response to the changes in the political risk that have been minimized by the National Risk Guide. The results of this study showed that as political risk increases, the return of shares decreases and vice versa. However, this effect is so that with increasing the fluctuations of political risk, fluctuations in most emerging markets are more than developed.

Internal studies

Internal indices such as exchange rate fluctuations, oil prices, inflation, and financial risk have been discussed. For example, Oranus Parivar and Hosni (2018), in a paper using the self-stimulation model and the inconsistency of multivariate variance (MGARCH), the relationship between the housing market, the stock market index and the real exchange rate in Iran have been analytically analyzed. For this purpose, the monthly data of April 2004-May 2018 was used. According to the results, there is no significant effect on the return of other markets to the housing market. However, there are negative and significant effects on the stock market return, as well as negative effects on the market base of the currency market. In addition, the effect of simultaneous fluctuations between the real estate market, the exchange market and the stock market has been studied. The results show that each market is not independent and fluctuations in a market affect other markets in addition to their impact on the market itself. Because of the degree of concurrent fluctuations among these three markets, policy makers can also consider policy tools in other markets to

reduce decision-making in the context of policy-making in a market. In addition, investors will be able to reduce their investment risk by allocating their capital between the three markets.

Mahdavi-Alikhan Bazand (2017) explores in an article that explores the factors affecting the capital market in Iran during the 1991-2013 period based on the seasonal data of Mary. In this research variables, the stock price index, liquidity, toorum, gross domestic product, exchange rate, tax and state expenditure were included. In order to investigate the relationship between variables, the Johanson coalescence and the VAR method were used. Based on the results, action and reaction parameters analysis (IRF) of EXCHANGE response to a single shock unit imported from a positive liquidity region. Random shock of government expenditure has a slight effect on the return of stock in the short term, but after the second period, the positive effect of these shocks is determined, so that in the long term government expenditure will have a positive effect on the index. The effects of random tax shocks on Sam price index are negative. The positive random shock effect in GDP is also positive.

The Gugerchian et al. (2015) in a comparative study of the impact of political risk on the development of the stock market for the period of 2005-2012. Using the IARA (2008) model, the factor analysis method for combining the depth and width variables of the stock market and creating stock market development indicators and dynamic panel based on GMM methods is applied. The results show that the political risk has a significant effect on the depth and width of the selected stock market. The results also show that political risk in developed countries has a greater impact on stock market development indicators in these countries than in developing countries.

Khodaparast et al. (2014) examined the factors affecting the short- and long-term return of shares offered in the initial offers on the Tehran Stock Exchange during 2006-2011 by using census sampling method from state-owned companies included in Article 44 of the Constitution and non-governmental companies. The results show that the average short-term return of state-assigned companies during this period is 5.19% (modified with market efficiency) and only 8% for private companies. Also, the long-term returns of the government-non-governmental and non-governmental companies were 4.38% and -1.58%, respectively. The size of company and in private companies, company life, P/E ratio and riyal value were the most important variables affecting the short-term efficiency.

Mehrara et al. (2013) in a study using the Capital Asset Pricing Model; The top 50 companies selected the Tehran Stock Exchange from 2008 to 2013, using the panel data technique, concluded that there is a significant relationship between the systematic risk and the return of their shares. Also, the results show that the nonlinear relationship (second degree) better than linear relationship can express the relationship between risk and return, which means there is no linear relationship between the systematic risk and stock return in the selected sample.

Shahrabadi and Balini (2012) reviewed the effects of oil prices, exchange rate and systematic risk on the return of regular stock companies from the Tehran Stock Exchange during the years 2006-2010. They reviewed the effects of oil prices, exchange rates and the systematic risk of the stock exchange. In general, based on the R2 calculated among macroeconomic variables, systematic risk and return of companies, there is a meaningful and weak relationship between them. Only 9.7% of stock return changes are determined by oil prices and 24% of stock return changes by systematic risk, while other factors influence the return of shares.

Fathi and Kabiripour (2012) in a research titled "Studying the Dimensions of Political Risk and its Effects on Foreign Investment" have evaluated the effects of political risks on the flow of foreign direct investment and have considered its different dimensions from various angles. Because of the close relationship between political risk and investment, studies were conducted only to four sources of political risk, including

politics, tax system, corruption and political tension. The results showed that among the four above sources, except corruption, which has no such effect on direct foreign investment, other factors significantly affect foreign direct investment flows.

Fathi et al. (2010) have studied the impact of macroeconomic variables on the development of Tehran Stock Exchange during the period of 1368-1376. For this purpose, national income, investment rate, the development level of intermediate financial institutions and macroeconomic instability are considered as major economic variables and depth and width as indicators. The results show that national income and investment rate have a positive and significant effect on the depth and width of the stock exchange. Also, the development level of intermediate financial institutions and instabilities of macroeconomics have a negative and significant effect on the depth and width of securities.

After the year 1980, Pashaei Faam and Omidipour (2006) studied the impact of inflation on the real return of the shares using the seasonal data from 1990 to 2006. The results of the concurrent test indicate that there is a long-term relationship between the price fluctuations and the exchange rate with the growth rate of the cash return index. Also, a long-term relationship between growth rate and oil return index and negative exchange rate and inflation rate is positive, and a long-term relationship with inflation rate. In addition, by reviewing them, the significant rate of liquidity growth was rejected at 90% confidence level. It can be concluded that this research has been neglected by local researchers in recent years, due to the high importance of studying the impact of macroeconomic variables on the return of stock market in recent years and considering the rapid changes in macroeconomics of Iran. On the other hand, emphasis on the country's risk index, including financial and political risks, as well as international risks with the current condition of the stock exchange, has not been included in any internal investigation.

- Research Methodology

In this research, the research method was used to collect the theoretical and literature of the research. By studying relevant books and journals and referring to specialized sites, the necessary information was collected. In addition for collecting the required data, the analytics method is used and reference sites are used.

In this research for data analysis such as Kerkaleli Research (2018), Regression Model Number(1) is used and then estimated by Markov Saching method.

$$Re_t = \alpha_0 + \alpha_1 FR_t + \alpha_2 PR_t + \alpha_3 ER_t + \alpha_4 GR_t + \alpha_5 INF_t + \alpha_6 VEX_t + \alpha_7 Oil_t + e \quad \text{Equation (1)}$$

In which

Re_t: is the price index efficiency of the Tehran Stock Exchange.

FR_t: The financial risk is calculated based on the PRG Institute's financial risk index and the financial stress index, whose data is more available.

ER_t: It shows economic risk. And based on the financial risk index of the PRG Institute and the financial stress index, which is more available.

PR: The licence of political, legal, and institutional factors is a country that shows the extent of the risk of political space in the country. The data were calculated based on ICRG index and two indicators of political stability and violence and World Bank rule.

GR: Global economic hazards for this variable are the economic hazards index taken from the Economic Policy Uncertainty site. The score is from zero to 100. In general, the average weight of political and economic risks is monthly in 143 countries of the world, which is finally presented.

INF: The inflation rate is internal, with data from the World Bank.

Vex: Exchange rate changes that are obtained from the World Bank.

Oil: The proportion of oil revenues to gross domestic product.

3.1- Calculating and measuring variables

In the next section, the exact method of calculating different variables is presented.

In this study, according to the study of Stouna et al. (2018), Dargahi and Nikjou (2012) and Haidari and et al. (2019) of the economy have been divided into two monetary and financial sectors. In each sector, a number of variables have been considered as representative of the monetary and financial sector. This study is considered to determine the instability in the country's foreign currency and state finance sectors in terms of working in the Iranian economy (2012) and Heidari et al. (2019). The point to be addressed about Iran's economy is large-scale government presence and the import of shocks on the part of the government, which this cost-effective shock causes shock in many other economic variables. It is necessary to import the government in the economic risk. Another market that has always affected Iran's economy in recent years, especially after the revolution, is the exchange market. It is especially important because Iran's economy depends on its production (imports of intermediate goods and commodities) and its consumption (the imports of final goods and technology) to import. Therefore, the better the index is to enter the exchange market in this index. So, calculating the risk in this research is closer to the reality of the risk taking in Iran's economy.

Calculate the risk in the public sector: Three variables of government spending to GDP, state tax revenues to GDP, and state revenues to GDP were used to calculate the index.

Government costs: In addition, inflation and the government's interference in the economy and ultimately more competition with the private sector, and since the more government intervention in the economy, the more the economy is ineffective in the economy. Therefore, greater involvement of the government from its long-term process in the economy causes more inflation and inefficiency in the economy and more corruption. On the other hand, due to the economic dependence of Iran and the creation of infrastructure services, all depend on government spending. Therefore, the excessive decrease in government spending risks (Heidari et al., 2019). In this regard, at first, by using the Prescott guidance filtering method, the variable fluctuations are separated from the long-term process and then the negative and positive fluctuations are rated between zero (minimum tension) and 100 (maximum tension).

Government tax revenues: According to the research literature, the higher the government's tax revenues, the government's reliance on oil, and the economy is more interactive and also because of the government's decreased reliance on oil, the impact of the monetary base on oil revenues decreases. As a result, the negative effects of oil revenues on inflation are limited (Stona et al., (2018), Heidarian and Humran (2019). Therefore, the less tax revenues than its long-term process, the more negative effects on the economy. Therefore, first, by using Puric Prescott filtering, the variable fluctuations are separated from the long-term process and then its negative fluctuations are rated between zero (minimum tension) and 100 (the most tension).

Oil revenue to GDP ratio: The lower oil income because the government's involvement in the economy will ease the financial tension, and, at the same time, as the economy depends on oil and its revenues, many of the government's basic services will be impaired for the economy because of its dependence on oil revenues. Therefore, it seems that the deviation of state revenues from its long-term process in both negative and positive cases will lead to tension in the economy. Therefore, by using Puric Prescott filtering, variable fluctuations are separated from the long-term process and then its positive and negative fluctuations are rated between zero and a hundred.

Currency market:

Another market, which is capable of creating tension in Iran, is the currency market. According to the literature of research and according to many experimental studies in this field, the structure of production and consumption in Iran is dependent on the import sector. The production sector depends on imports, because the production sector in Iran's economy depends on imports of capital and intermediary goods. According to Iranian imports, in recent years, Iran's imports generally comprise about 60 percent of the total imports of Iran's economy. Therefore, it is clear that the production sector is largely dependent on currency price fluctuations, and especially the increase in the rate of equality of the dollar and toman, can affect imports in the trades of intermediate and capital goods and consequently the production of the economy. In addition, the import sector of final goods accounts for 30 to 40 percent of imports, which can be very sensitive to the exchange rate and fluctuations of these products. In particular, the increase in the rate will affect the overall consumption of the Iranian economy. Therefore the exchange rate fluctuations have the ability of both production and consumption sectors (Shakeri, 2010, Ali and Molaei, 2017, Norouzi 2019). According to various studies, including Stone et al. (2018), Dargahi and Nikjou (2010), Haidari et al. (2019) are used of two premium currency variables and real exchange rate in the economy to show the economic risk capacity.

Premium exchange rate: One of the important variables in measuring the exchange market stress is the difference between the official exchange rates and the free market. The implementation of the multiple exchange rate system causes an impairment in the proper allocation of foreign currency. In order to extract the stress index, the maximum rate of exchange rate of 100 and the lowest amount of it is equivalent to zero.

Premium exchange rate:

The real exchange rate is the same as the ratio of foreign to domestic prices in terms of the currency. For this index, the official exchange rate index on the World Bank site was used. For this purpose, stress analysis in this variable is extracted from the long-term process and then it is classified between zero and a hundred.

Financial risk: According to the literature of the economic sector, the financial sector is divided into the monetary and capital sector. Therefore, the financial risk generally consists in the monetary and capital sector, and because of the importance and dominance of the monetary sector on the Iranian economy, in practice, the financial risk is the monetary sector. In various studies, including Stone et al. (2018), Abura and Vn Ray (2017) and Dargahi (2010), generally, the volume of currency and liquidity, the ratio of short-term savings to long-term GDP, ratio of ungovernmental debt changes to GDP banks, the real interest rate of GDP, six variables were used in this study.

Banknotes and bills paid for: The increase in the volume of banknotes and sukuk to the volume of money from the process level shows an increase in transactions through money and a decrease in the use of visual deposits in economic transactions. This increase, which leads to a decrease in the value of monetary increases and as a result of a reduction in bank lending capacity, shows a decline in confidence in the banking system or a lack of development in the banking system in providing services to facilitate transactions. As a result, the increase in the ratio is considered as a sign of the financial tension. In this regard, at first, by using Puric Prescott Filter, the variable fluctuations are separated from the long-term process and then the positive fluctuations are rated between zero of tension (and 100).

Monetary to liquidity: This ratio represents the composition of assets based on the degree of restraint. The increase in the ratio from the trend shows that the banking system is unable to equip sources through absorbing long-term deposits. It should be noted that the banking system has two key duties to facilitate economic transactions by providing banking services, as well as equipping deposits to provide investment resources. In the case of the rise in the ratio that leads to financial tension, although the banking system

does the duty to facilitate transactions, it is incapable of implementing its other important task, which is the equipping of the sources of investment (Dargahi et al., 2010). This increase is a sign of increased tension in the banking sector. In order to construct the stress index, first, the positive fluctuations of mentioned variables were determined by the target filtering method, then the positive fluctuations were rated between 0 and 100.

Short-term deposit ratio: This ratio specifies the composition of the bank system's long-term deposits. The increase in the ratio from the trend has indicated the inability of the banking system to equip resources for long-term investments. Such conditions usually occur when the real profit rate of long-term deposits is low compared to other financial markets, which could lead to financial tension in the banking sector. In order to construct the stress index, the positive fluctuations in the mentioned ratio were determined by implementing the Prescott diffusion method, then positive fluctuations between 0 and 100 were rated.

Proportion of remaining deposits to GDP: The decline in the ratio from the trend level indicates a decrease in the banking system's ability to equip private sector sources and its continuation leads to imbalance in the resources and uses of the banking system and as a result of financial tension. In this method, at first, variable oscillations from its long-term process were extracted through Puric Prescott filtering and then negative fluctuations were separated.

Proportion of debt retention changes to GDP: The amount of the banking system's facilities in the money supply process has a decisive role in production and unemployment and inflation, so that increasing it leads to inflation and decreasing it in terms of conditions and reduces economic activities, so increasing fluctuations in the ratio indicates an increase in financial tension in the banking system, since the above level shows a lack of compliance with the volume of economic activities and infrastructure. Under such circumstances, the banks' facilities are not much used in productive economic activities and will be further inflation. On the other hand, the reduction in the ratio from the trend level indicates the lack of facilities for operating and investment activities of economic firms. In the economy as the sources of financing for firms mainly bank-oriented, this leads to recession and a decrease in economic growth. Therefore, the increased fluctuations of the ratio showed an increase in tension in the banking sector (Heydari et al., 2010). In this regard, at first, the fluctuation from the long-term process is extracted by Hodrik Prescott filtering method and then the fluctuations are rated between 0 and 100.

Real interest rates:

In Iran's banking system, the rate of real harmonious profit in the years under investigation is more negative. On the one hand, this leads to a limit on the supply of funds and causes the creation of the informal market, which is considered as a high nominal interest rate due to the high risk, and on the other hand, due to surplus demand of credit, the distribution of limited financial resources is inevitably necessary to be allocated for the profitable π project. In such a situation, efforts to find the most effective and efficient investment projects will be turned into a search for banking facilities to benefit from rent. In this research, negative fluctuations in the real interest rate of long-term deposits are considered as a source of tension in the banking sector. Therefore, by using the Prescott filtering, the fluctuations from the long-term process are extracted, then negative fluctuations are separated and ranged between 0 and 100.

After measuring the tension in the economic and financial sectors, it is now time to calculate the economic and national risks with the total number of variables. The major problem in aggregation of indices is the implementation of suitable weighting method. But according to the literature and economic conditions of Iran, it seems that these different parts of weight do not have the same level of stress in Iran economy. Therefore, it is necessary to use variable weighting method. Different studies such as Stuna et al. (2018), Abura and Van Rey (2017), Borio and Lav (2002) were used in general by the regression method of the

durational elements. In this method, first the rotational component of each variable used in building the combined index is regression with the rotational component of a reference variable (such as economic growth), which the combined index is built to explain, then the correlation coefficient is based on the (2) criteria of weighting to the combination index in financial stress.

$$W_k = \frac{r_k^2}{\sum_{k=1}^n r_k^2} \quad (\text{Equation 2})$$

In this study, to obtain the total financial stress index, after calculating stress index in different sectors, the time component of variables in each sector is regression to obtain the weight of each sector, and the correlation coefficient obtained based on the formula (1-3) is the basis for calculating different weights in the overall economic stress.

Political risk: Another variable needed to be explained is the political risk. In general, the PRG Institute calculates political risk based on the variables of income and expenditure of the employment government, life expectancy, rates of violence and street bickering, political stability, judicial file, corruption, property taking, violating contracts, internal political disputes. But the point is that this index information is not available. Therefore, it is necessary to identify an appropriate alternative index for political risk. Thus, to calculate the political risk, two indicators of political stability and violence control and World Bank rule, which are used to calculate the same political risk variables as the PRG Institute. Therefore, this index has a very close combination with the PRG political risk index.

International risk: Global economic hazards for this variable are the economic hazards index taken from the Economic Policy Uncertainty site. The score is from zero to 100. In general, the average weight of political and economic risks is monthly in 143 countries of the world, which is finally presented.

Table(1): Summary of research variables

Economic risk (weighted average of variables based on rotational (regression)	Variable	variable defining	Operational definition	Frequ ncy	Statistical source
	GEXP	Size of Government	Ratio of total government expenditure to GDP	Season al	Ministry of Economy
	TAXINC	Total government tax revenues	The ratio of total government tax revenue to GDP	Season al	Ministry of Economy
	Oil.inc	Government oil revenues	The total amount of government oil revenues to GDP	Season al	Ministry of Economy
	RER	Real exchange rates	Domestic price index / nominal exchange rate * Price index in the target country $RER = ER * P_{out}/P_{in}$	Annual ly	Global Bank

	PER	Premium exchange rate	The difference between the official and free exchange rates	Seasonal	Ministry of Economy
Financial risk (weighted average of variables based on rotational regression)	SHD/LOD	Ratio of short-term deposits to total long-term deposits	Ratio of short-term deposits to long-term deposits	Seasonal	Ministry of Economy
	M1/M2	Ratio of money to liquidity	Ratio of money to liquidity	Seasonal	Ministry of Economy
	Depo	Deposit balance ratio	Proportion of deposit balance to GDP	Seasonal	Ministry of Economy
	PDebt	Non-government debt balance ratio	Ratio of non-government debt to banks to GDP	Seasonal	Ministry of Economy
	RInt	Real interest rates	Nominal interest minus inflation rate $Rint = Int - Inf$	Annually	central bank
Political risk	Pol.Ris	Simple average of rule of law index and index of political stability and violence	Government revenues and expenditures, employment, life expectancy, rates of violence and street strife, political stability, litigation, corruption, expropriation, breach of contract, domestic political strife	Seasonal	Global Bank
International risk	GR	International risk	The score of this variable is from zero to 100 and generally includes the weighted average of political and economic risks on a monthly basis in 143 countries, which is finally presented in this index		Economic Policy Uncertainty
Exchange rate fluctuations	VEX	Exchange rate fluctuations	Separation of cycles from the process by Prescott hydraulic filter method	Seasonal	Ministry of Economy
The inflation rate	INF	Consumer price index	Consumer price index growth	Seasonal	Global Bank
Stock Return Index	SM	Return of Tehran Stock Market Index	Seasonal growth of the total stock market index of Tehran	Seasonal	Fib Iran

Source: Research Findings

- Durability test

Using common econometric methods in estimating model coefficients, it is based on the assumption that Durability model variables are. In general, a random process is called Durability when its average and variance is constant over time, and the covariance value between the two periods depends only on the distance or interruption between the two periods and is not related to the actual time of covariance calculation. In other words, if Y is considered as a random time variable with the following features:

$$\begin{aligned} E(Y_t) &= \mu \\ \text{Var}(Y_t) &= E(Y_t - \mu) = \sigma^2 \end{aligned} \quad (\text{Equation 3})$$

$$\gamma_k = E(Y_t - \mu)(Y_{t+k} - \mu)$$

In which the γ_k covarianth at the k -break is a covariant between values of Y_{t+k} and Y_t , i.e. between two values of Y at the time interval of kt . Now if the Y time series is passed from the time source of $t+m$ to $t+m$, the Y time series will be if the mean, variance, and the Y_{t+k} and Y_t are equal. So a time series will be limited when the mean, variance, and covariates are the same in different time series interruptions and they will remain constant.

- **VAR_SWE method**

In 1989, Hamilton first used Markov switching models in the time series econometric literature. Hamilton's research was specifically based on the premise that not only is nonlinear behavior present in economic time series, but that this nonlinear behavior is particularly implied in the asymmetry of economic cycles. Hamilton offers a model that, by recognizing the periodic transition from a positive growth rate to a negative growth rate due to US business cycles, one can see the different effects of this change in economic behavior. After Hamilton's study, Markov switching models have been widely used in the analysis of various economic phenomena. The studies of Krolzig (1997) and Kim and Nelson (1993) have well covered the various applications of Markov switching models and how to estimate them.

In addition to developing (MSVAR) models for convenience and simplification, the study by Krolzig (1998) made it possible to estimate MSVAR models in OX software. This software is able to easily make available Markov switching technology, which has a very complex programming language, so that MSVAR models can be used in econometric analysis. The main idea of Markov switching models is that the parameters of the VAR model depend on the variable of the S_t regime. At the same time, S_t is not visible and only the probability related to it can be obtained (Asgharpour et al., 2018).

In nonlinear models, it is assumed that the behavior of the variable on which the modeling is performed is different and changes in different situations. Nonlinear models are divided into two main groups in terms of the speed of change from one state to another. In some of these nonlinear models, the transition from one position to another is smooth and slow (such as the STAR and artificial grid models); This is the type of model. In STAR and artificial network models, the process of regime conversion is gradual and the process of moderation in these models depends on the state of the system (Heydarian et al., 2019).

For a better understanding of the Markov-switching model, suppose the static variable y_t is described for the first regime = $S_t = 1$ by the autoregressive process (3-11). Now suppose that the variable for the second regime 2 $S_t = 2$ is explained by a different autoregressive model of Equation (3-12).

$$y_t = a_1 + \beta_1 y_{t-1} + \varepsilon_{1t} \quad \varepsilon_{1t} \rightarrow N(0, \sigma_1^2) \quad (4-3)$$

$$y_t = a_2 + \beta_2 y_{t-1} + \varepsilon_{2t} \quad \varepsilon_{2t} \rightarrow N(0, \sigma_2^2) \quad (5-3)$$

Assuming that the variable y_t is a P-order autoregressive process and modeled with the M regime, then we have the equation (3-6).

$$y_t = \sum_{i=1}^m \left(\sum_{j=1}^p (\beta_{ij} y_{t-j}) + u_{it} \right) I_i(S_t = i) \quad I_i(S_t = i) = \begin{cases} S_t = i \rightarrow 1 \\ S_t \neq i \rightarrow 0 \end{cases} \quad (6-3_)$$

In Equation (3-6), the probability of state transfer from one regime to another can be calculated in the form of conditional probabilities. For example, in this model, P_{ij} , which represents the transition from regime i to j, is defined as Equation (7-3).

$$P_{ij} = P(S_{t+1} = j | S_t = i); \quad \sum_{j=1}^m P_{ij} = 1, \forall i, j \in (1, 2, \dots, m) \quad (7-3)$$

Also = N (0, ε) S_t and U_t is a Markov chain with N regimes and is independent of U_t for all ts. So that P_{12} is the probability of transition from recession to prosperity and P_{21} is the probability of transition from prosperity to recession and P_{11} is the probability of stability of the recession regime and P_{22} is the probability of stability of the prosperity regime. Markov-switching models for predicting financial stress in Iran are classified into different types of classes depending on which part of the autoregressive model is dependent on the regime and is transferred under its influence. Markov-switching models are mean (MSM, width from origin) (MSI of autoregressive parameters (MSA and heterogeneity in MSH variance)).

In general, different types of Markov-switching autoregressive models can be explained using the linear autoregressive model. Assuming an autoregressive model, we have order p according to Equation (3-8).

$$\Delta y_t = V + \sum_{i=1}^p A_i \Delta y_{t-i} + u_t \quad \left\{ \begin{array}{l} V = V(S_t) \rightarrow MSI \\ A_i = A_i(S_t) \rightarrow MSA \\ VAR(u) = (VAR(u))(S_t) \rightarrow MSH \end{array} \right\} \quad (8-3)$$

Where Δy represents the variable of financial stress as well as $V(S_t)$ the average process or width of origin

in different regimes. Also A_i and B_i are the coefficients of AR and MR variables, respectively. ε_t series of residuals. Markov-switching model estimation is done by methods such as maximum descriptive estimation, maximum maximum expectation and Gebz sampling method. In order to be able to choose the best model from the mentioned models, in this research, the model selection strategy will be as follows.

- Determining the number of optimal interrupts for the variables in the model using Akaik information statistics for all possible states of the Markov-switching model
- Comparison of estimated modes based on three features
 - Having the most significant coefficients (especially regime-dependent components)
 - Having the maximum value of the maximum likelihood function
 - Having a minimum variance of disruptive sentences

4. Model estimation

In this section, the results of estimating the switching model and related tests are presented. The first step in estimating time series is to examine the semantic status of the variables. Given that the time series used in this study are more frequent than annual; It is necessary to investigate the existence of the root of the seasonal unit. For this purpose, first the reliability of these variables is checked using the root test of the jewelry unit and Andrews (1992). The results of Ziwat and Andrews test are estimated in Table (2). The null hypothesis of the Ziott and Andrews test is the existence of a single root despite structural failure.

Table 2: Zayat and Andrews test results

Variable	Economic risk	financial risk	International risk	Political risk	Inflation	Oil to gross national income	Exchange rate fluctuations	Stock index returns
Year of structural failure	The second season of 2016	Season 3, 2016	Season 3, 2012	Season 4, 2012	Season 2, 2012	Season 2, 2011	Season 2, 2017	The first season of 2014
T statistic	4.74-	6.21-	5.45-	4.37-	3.08-	4.07-	5.10-	2.011-
Statistical probability	0.024	0.000	0.000	0.000	0.008	0.012	0.005	0.0021

Source: Research Findings

Carefully in the estimated results of the Zayat-Andrews test, it is shown that all variables are constant by considering the equation of simultaneous change in width from the origin and slope despite the structural failure, and the model can be formulated without worrying about false results. Estimated time series.

Determine the optimal interrupt

The first step in estimating MS-VAR models is to determine the optimal number of interrupts using Akaik or Schwartz criteria and because in this study the number of samples is less than 100, Schwartz criterion is used to determine the optimal lag (Nofaresti, 1999). Table (3) shows the values of Akaik, Hanan-Quick, Schwartz for intervals 1 to 3.

Table (3): Determining the optimal interrupt

model	lag	AIC	SC	HQ
model	1	59.50001	*62.5092	60.5957
	2	60.42159	66.10563	62.4919
	3	*56.57569	64.9345	*59.6194

*: Indicates the lowest criterion value Source: Research Findings

According to the table, the lowest Schwartz criterion value for the optimal interrupt is in the first interrupt model. The next step in estimating Markov models is to determine the number of optimal diets. For this purpose, first estimate the model with different diets and select the minimum value of Akaike and Schwartz criteria as well as the maximum value of the maximum right function obtained as the optimal regime. We estimate and interpret the model based on the results of the optimal regime. Table (4) shows the values of the Akaike, Schwartz, and maximum likelihood functions.

Table (4): Determining the optimal model regime

Model	ML statistics	ACI statistics	SC statistics	Number of regime
Model	*1082.1059-	*62.60	*68.06	2
	1082.9292-	65.99	79.75	3
	1121.16314 -	60.61	80.35	4

*: Best Criteria Source: Research Findings

According to the results of the estimates to know the best regime, in all cases, the two-regime mode has the highest value of the maximum straight function criterion and the lowest criterion of Akaike and Schwartz, so the results of the best interrupt and the best model regime, model with One interval and two regimens (1) VAR- (2) MS are estimated.

- Model estimation by switching method

The results of estimating the Marco Sochingver model are shown in Table (5). The first step in using Markov models is to determine the linearity and nonlinearity of the model using the LR test. The statistics of this test is calculated from the maximum likelihood values of two competing models, linear and nonlinear models, which have a chi-square distribution. If the value of the satisfied statistic is higher than the critical

values of the table at the desired confidence levels, then the null hypothesis of the test that the model is linear cannot be accepted, so the nonlinear model should be used. According to the results, the probability of LR test statistics is less than 5% and it is based on rejecting the null hypothesis and confirming that nonlinear models are more appropriate. In ver models, coefficient analysis is not the goal due to two-way relations and most of the impact pulses are analyzed. Table 5 shows one of the equations in which the stock return is a dependent variable and shows the effect of the effects of independent variables on the stock index. According to the results of transfer probability, the probability of staying in the first and second diets is high, so that the probability of staying in the first diet is equal to 83% and the probability of staying in the second diet is 77%. It is a percentage and the probability of transition from a one to zero regime is 23%.

Table (5): The output of one of the equations in which the stock return index is a dependent variable

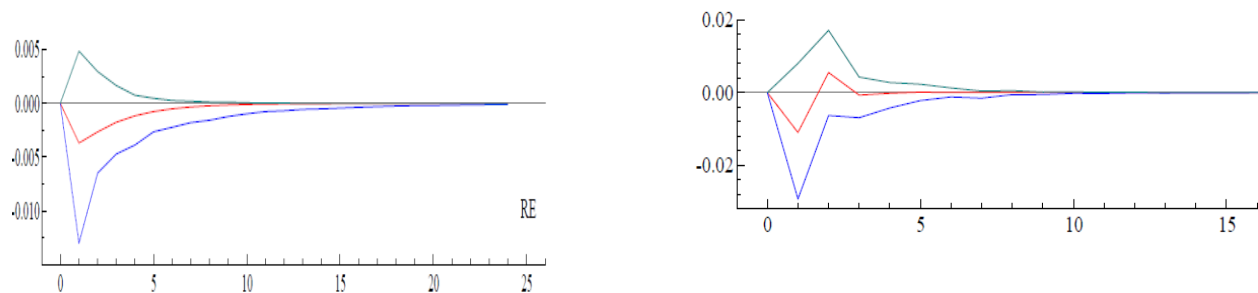
Variables	Coefficients	t statistics	Statistical probability
(0) Intercept	0,5165	4,9800	0.0000
(1) Intercept	-0,3794	-2,4600	0.0000
ER_1(0)	0,0098	3,8300	0.0321
ER_1(1)	-0,0027	-0,9570	0,021
PR_1(0)	-0,0049	-1,7700	0.0101
PR_1(1)	0,0066	2,0200	0.0203
GR_1(0)	0.000	-0.6800	0.0001
GR_1(1)	0.00001	1,3000	0.0006
ver_1(0)	0,0012	0,8710	0.0123
ver_1(1)	0,0045	0,0503	0.0460
ver_1(2)	0,0031	0,2960	0.0324
FR_1(0)	-0,0013	-0,3830	0.0390
FR_1(1)	0,0029	1,4700	0.0129
inf_1(0)	-0,0067	-2,5500	0.0239
inf_1(1)	0,0011	0,1610	0.023
oil_1(0)	-,0337	-11,0000	0.0093
oil_1(1)	- 0.0805	-4,5000	0.0234
Re_1(0)	-0,0076	-0,0520	0.0434
Re_1(1)	0,1054	0,8900	0.0123
LR382,146			
(0.000)		Regime 0,t Regime 1,t	
Log-likelihood	Regime 0,t+1	0,83	0,23
1082.1059-	Regime 1,t+1	0,17	0,77
AIC			
62.60			
SIC			
68.08			

- Risk impact charts and stock index reaction

In impact response functions, one of the model variables is hit and its effect on the variable itself and other variables can be seen. Here we examine the impact of the impact on the variable and its reaction by the stock index. Impact response functions represent the extent to which the objective function responds to a shock by a standard deviation during future interruptions.

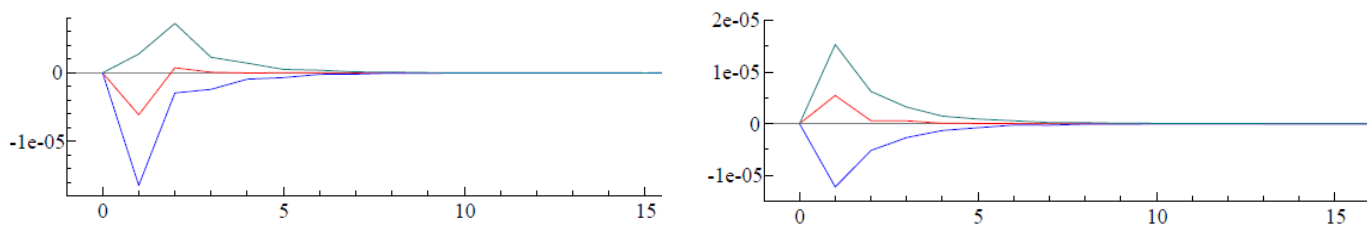
According to Figure (1), the effect of doubt on economic risk in the first regime is faced with a negative response from the stock market index, so that this negative effect increases until the next season and decreases after one season, and in the next season Doubt disappears and also has a negative effect on the second diet and from the next three periods has a positive effect and the effect of doubt disappears.

Figure (1): Doubt of economic risk and stock market return index reaction (left of the first regime, right of the second regime)



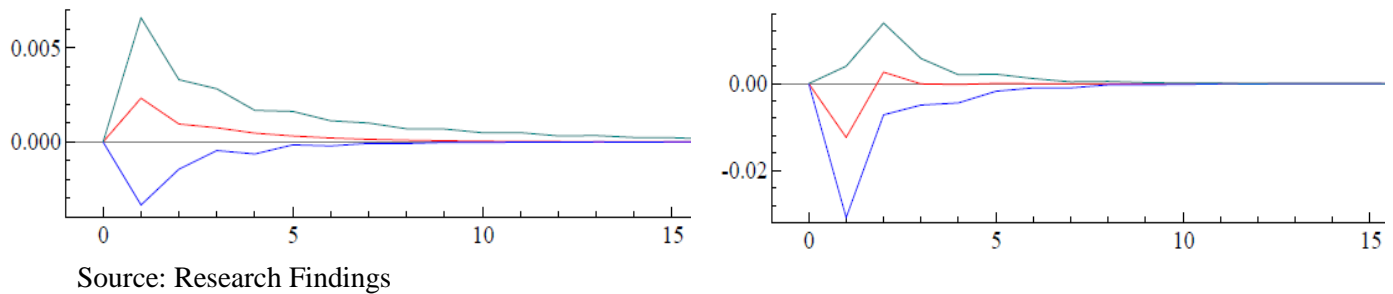
According to Figure 2 on the right, which is the first regime, there is doubt about the international risk and it shows the effectiveness of the index. The negative impact season is declining until after three seasons the impact is gone. And in the second regime, doubt is answered with a positive effect, which means that international risk causes the growth of the stock index and this effect disappears in three seasons.

Figure (2): Doubt of international risk and stock market return index reaction (left of the first regime, right of the second regime)



According to Figure 3 on the right, which shows the doubt about financial risk in the first regime (prosperity), the effect of this doubt on the stock market index is positive, so that with increasing financial risk, the stock market index has grown and during The four seasons of this effect disappear and also the chart on the right shows a different effect in the second regime (recession) in such a way that increasing the risk reduces the stock index.

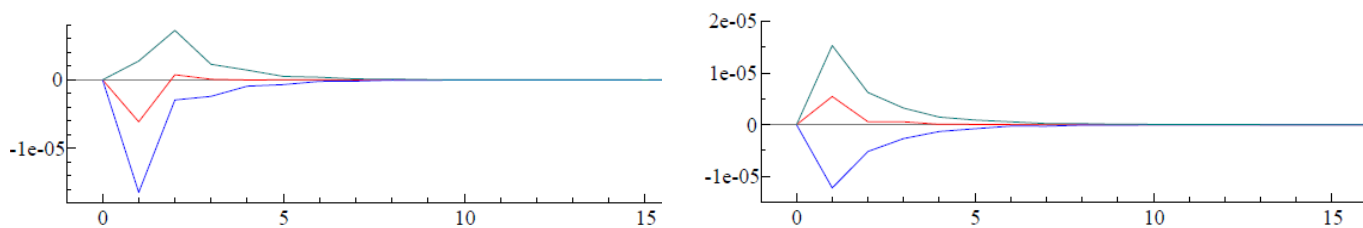
Figure 3: Doubt of financial risk and stock market return index reaction (left of the first regime, right of the second regime)



Source: Research Findings

According to the diagrams in Figure 4, the variables of political risk have the same effect as international risk, so that they have a negative effect in the boom regime and a positive effect in the recession regime.

Figure (4): Doubt of political risk and stock market return index reaction (left of the first regime, right of the second regime)



In this study, the effect of economic, financial, international and political risks on the stock exchange index was investigated. The results show that most of the effects are negative and this is confirmed by the theoretical principles. Risks in the economic environment by themselves reduced the desire of people to avoid long-term investment and the tendency to invest in other markets, but the results can also be seen a positive effect, which differs from the theoretical foundations. The reason for this in Iran is the impact of existing risks on the exchange rate and the attractiveness of short-term stock exchanges and speculative demand is formed. Due to the fact that currency-based companies cover a large part of the stock market, it raises the index, and due to the dampers, this effect also disappears and is a short-term phenomenon. In any case, it can be seen that in the risky environments, the economy is short-lived and we cannot expect continuous growth, which in turn hinders economic development.

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